

**ECOLOGICAL IMPLICATIONS OF  
INCREASED SAN JOAQUIN RIVER FLOW IN  
SAN FRANCISCO BAY/DELTA ECOSYSTEM:  
INDICATORS OF ADVERSE EFFECTS**

**#0081**

# Technical Panel Review

*Proposal Name:* ECOLOGICAL IMPLICATIONS OF INCREASED SAN JOAQUIN RIVER FLOW IN SAN FRANCISCO BAY/DELTA ECOSYSTEM: INDICATORS OF ADVERSE EFFECTS

*Applicant Organization:* U. S. Geological Survey

*Principal Lead Investigator(s):*

Luoma, Samuel

Stewart, Andrea Robin

Thompson, Janet

*Amount Requested:* \$691,187

*TSP Panel Summary of Findings:*

This project addresses the possible impacts of increased flow of San Joaquin River (SJR) water into the Delta and Bay as a result of new or anticipated management practices within the Sacramento River and San Joaquin River and Delta regions. There are several beneficial impacts that could accrue as a result of this project, including a better understanding of the risks and risk tradeoffs associated with increased SJR flows into the Delta; clearly this is a high priority matter for CALFED.

Unfortunately, the way the proposal was written failed to completely describe that the hydrology work is presently being done in another project (CALFED CASCADE). The majority of the reviewers were not familiar with the CALFED CASCADE project. The proposal didn't clearly state that data obtained from the CALFED CASCADE project would contribute to the present proposal studies in terms of the hydrological findings. The fact that the present proposal is so dependent on the hydrology results from the CALFED CASCADE project led to the panel rating this proposal as inadequate. This was based on concerns that the data obtained from the CALFED CASCADE project will not provide all of the hydrology data needed for this proposal, and the lack of a contingent plan in the event that the necessary hydrology data from the CALFED CASCADE

## Technical Panel Review

project isn't obtained.

Thus despite the enormous potential relevance of this study to the management of the San Francisco Delta and Estuary, there are enough concerns to lead to a less than complete endorsement for support. The panel recommends that the applicant resubmit the proposal after the CALFED CASCADE-funded research is completed. The proposal will most likely need to be reworked depending on the results obtained from that study, as it seems that the current proposal is highly dependent upon the results obtained from the CALFED CASCADE-funded study.

### *Relevance to PSP Topic Areas:*

High

### *TSP Technical Rating:*

Inadequate

### *TSP Funding Recommendation:*

Do Not Fund

*TSP Amount Recommended:* \$0

### *Conditions:*

# External Technical Review #1

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**Proposal Applicant:** U. S. Geological Survey

## Purpose

Comments	<p>With the exception of the first hypothesis, hypotheses are clear. The first is a statement that may or may not be true depending on variable conditions. However, the first also relates to identification of measures of San Joaquin River inputs which all the subsequent research depends on. It does not seem clear that the measures identified in the Table are even a complete, appropriate set to choose from given that they are termed estimates in the proposal and the following quote is made about them "It is unclear if estimates of the amount of San Joaquin River water entering the North Bay are actually doing so..."- have they been validated in the field? This task is linked to another modeling project but only during time periods when the two overlap.</p> <p>The idea of identifying potential deleterious effects of SJR inputs as changes in such inputs are considered by water managers is timely. However, the studies seem to require a step-wise progression that may or may not be successful. A pilot project, or a subset of the proposed studies, might be a better approach. If the SJR measures can be identified and validated, then the effects of varying SJR inputs can be examined. The investigators then must be able to discriminate SJR contributions of Se and phytoplankton from other potential sources, And, although Se is an important contaminant on its own, it may not be the best</p>
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	surrogate to give water managers an idea of what is also happening with other contaminants given its chemical and biochemical nature.
<b>Rating</b>	Sufficient

## Background

<b>Comments</b>	The model of potential ecosystem change with management change is explained fairly well. The basis for the proposed work is included. This proposal is precipitated by previous work by these authors although there are some unknowns that come with those approaches, including the likely inability to exclude other causal factors and possible processes within the Delta system (such as the dynamics of the phytoplankton community).
<b>Rating</b>	Above Average

## Approach

<b>Comments</b>	The tasks, in general, follow a logical progression. The initial task does raise questions of how accurate the estimates must be to support the linkages being evaluated and how the phytoplankton dynamics in the Delta system (including impacts of nutrients on those dynamics) are considered. A subsequent task using historic data and archived samples to look at invasive species impact on phytoplankton dynamics does not clearly consider that there may be factors beyond SJR flow that will be particularly difficult to identify historically. Also, one invasive being considered does not appear to show the seasonal cycle for Se that follows the SJR inflow cycle (Fig. 1), raising questions about linkages.. There are a few steps in the process described here where there is a consideration of alternatives, particularly with Se. But it is not clear how the models and estimates will take such findings, if they occur, into account. Also see Feasibility.
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	<p>The personnel responsible for project management are clearly identified and other personnel that are needed are included in the budget.</p> <p>A contribution to modeling studies of the Delta could result from this project as well as data sets of use to water managers. The authors have identified avenues for dissemination of project results.</p>
<b>Rating</b>	Sufficient

### Feasibility

<b>Comments</b>	<p>See comments under purpose on the SJR measures to be used and the potential for other factors to influence the outcome of the project. Also, actual measures of nutrients and contaminants (in this case, Se) in SJR inputs will not be made (see Figure 4 of the proposal). Also, there are tasks that are supposed to supply a long-term data set based on historic data and archived samples. These appear to be biological data only. It is unclear that the hydrologic/physical data (which should match the variables in Task 1) are available so it is unclear what they will be using to represent SJR inputs. These authors have worked on projects of this scale in this system</p>
<b>Rating</b>	Sufficient

### Budget

<b>Comments</b>	<p>Overall, the budget identifies salaries and other expenses by task. Some specific points: - Operative expenses under Task Four do not match the Budget Justification. - A significant increase in amount per hour occurs in Year 3 for the technician under Task 3 - this should be explained. - Under Feasibility, certain measurements are noted as being made under contract with laboratories previously used but this is not spelled out in the budget except for a subcontract under Task 4. These may be under Operating Expenses in previous tasks. - It is not clear if any expense will</p>
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## External Technical Review #1

	<p>be incurred from obtaining modeled findings from the CASCADE project. None are currently listed but the status of the collaboration is not clearly stated.</p> <p>Given past work, the authors will likely have or have access to the majority of required equipment and supplies.</p>
<b>Rating</b>	Above Average

## Relevance To CALFED

<b>Comments</b>	<p>The proposal clearly and directly addresses topics in the Priority Research Topic List. It includes the use of existing information (and the analysis of existing samples) as well as the involvement of multiple disciplines and modeling. Information from these studies will be useful in a preliminary way if linkages between SJR inflows and indicators of change can be suggested by "coincident trends" with other causes then ruled out or considered to be minimal. As noted in the proposal, ultimately, chemical data, which will not be collected for these studies, will be essential to verify linkages. Such studies would be proposed at a later date.</p>
<b>Rating</b>	Above Average

## Qualifications

<b>Comments</b>	<p>These authors have long-term and relevant experience in the Bay-Delta system, including leading and working on other large projects. Because of their past experience and affiliations, they have both the infrastructure and the collaborative relationships in place to initiate this project.</p>
<b>Rating</b>	Superior

## Overall Evaluation Summary Rating

<b>Comments</b>	<p>This proposal has positive aspects in that it attempts to address timely issues that CalFed currently feels are priorities for research. The team (at least at the highest level) has worked in this system and has access to contacts and equipment that are needed. The proposal is multi-faceted and ambitious, attempting to resolve some unknowns. However, the proposal is based on an understanding of and connection to SJR flows (through identification of variables). This seems to be a preliminary step that should be taken before all else is agreed to (see Purpose above). Then, there are questions of the ability to isolate processes in the system. Additionally, nutrients and contaminants won't be measured and advected phytoplankton will be predicted. Because statistical correlations are one of the end products, measured data would bolster these relationships. Also, it is not clear what physical/hydrologic data will be used in models from historic data sets.</p>
<b>Rating</b>	Above Average



## External Technical Review #2

**Proposal Title:** ECOLOGICAL IMPLICATIONS OF INCREASED SAN JOAQUIN RIVER FLOW IN SAN FRANCISCO BAY/DELTA ECOSYSTEM: INDICATORS OF ADVERSE EFFECTS

**Proposal Number:** 0081

**Proposal Applicant:** U. S. Geological Survey

### Purpose

Comments	<p>The goals, objectives and hypotheses are clearly laid out and appear to be internally consistent. The study is required in respect of future sustainable management of the ecosystem and builds on existing knowledge in a consistent fashion. The results will include a full evaluation of archived sample material and new data that should provide a very useful historical time series related to relevant environmental change. The project is important in-as-much as it identifies key invasive species of bivalves the populations of which are limited by food supply and by nutrients that may be enriched by transfer of waters. Selenium is identified as a key pollutant that regulates the ecology of the Bay the flux and storage of which requires improved resolution. Key indicators of environmental change will be identified and a better population dynamics model for these species should result from this investigation. In addition these bivalves are an important food for endangered species of sturgeon and thus their population dynamics are germane to the conservation of fish species in the Bay.</p>
Rating	Above Average

## Background

Comments	The background to this study is clearly expressed with respect to the environmental issues especially the present and potential ecological impacts of changes in water transfers. What is not so well explained is the detail of the nature and timing of water transfers and the water fluxes involved. If the complexity of the fluxes and the later tidal mixing of parcels of water are not known then the environmental implications arising from the new ecological models will be more difficult to evaluate. It appears that the sources of water may have been modelled but this background is not well developed.
Rating	Inadequate

## Approach

Comments	The general approach is well documented and is technically sound. In principle it is appropriate to meet the objectives but there are concerns with respect to feasibility in terms of compatibility of existing data and the evaluation of inherent uncertainty (see Feasibility issues below). The division of effort for project management is clearly presented and the project administration seems appropriate. The project outputs should in principle be highly valuable especially those within Tasks 3 and 4 (which are well described), but these outputs are dependent upon Task 2 the output from which may be suspect (see Feasibility issues below). The plans for dissemination of the results include public posting of the data on a web site. However no time scale to achieve this is provided. The dissemination of the research findings are somewhat parochial aiming at presentations at internal review meetings and latterly at regional meetings through oral and poster presentations. No mention is made of international
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	scientific meetings, international peer-reviewed publications or the contribution of this project to the development of generic models applicable elsewhere in the USA and the world.
Rating	Sufficient

### Feasibility

Comments	<p>The general approach is well documented and is technically straightforward and thus there is little risk of project failure from a technological standpoint. However as stated by the applicants Tasks 3 and 4 are predicated on a successful outcome to Task 2: task 2a requires evaluation of different measures of water flux from the SJR to the Bay area coupled to assay of phytoplankton sources and transfers downstream. Here I have considerable difficulty. The proposal refers to Table 1 which is poorly related to issues of Selium. I think here they mean to refer to table 2. However no information is provided as to how water quality will be determined for different water bodies. Only phytoplankton is mentioned as a 'tracer'. New monitoring or analysis of existing data on suspended solids, Selium or other tracers is not proposed and so it is not evident how different water masses are to be identified. Specifically, no explanation is provided as to how the different measurements of fluid flux will be evaluated. What comparators are available or will be developed? What checks are to be made that the gaugings are comparable and have not changed through time owing to changes in measurement techniques? Where is there any uncertainty analysis? Would not this part of the project be stronger if the range of inherent uncertainty was built into the procedures for evaluating predicted outcomes? Known sources of phytoplankton are identified as are degradation models for same, but how are these sources quantified and what degradation models will be used and what is the nature and robustness of the degradation models? How do different assumptions on controls on degradation effect the models outputs?</p>
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	<p>Could the model outputs range so widely as to make them useless - where has this been considered? Why are the predicted downstream decreases in biomass not to be validated by downstream transects of field data? Under Task 2b the Monsen model is not explained nor is it explained how the outputs from this model can be compared with the other results from 2b. What happens if the two predictions here are not in agreement? In conclusion the scale of the project is in accord with the stated objectives and data will be derived that can inform ecological modelling but I question the robustness of the hydrological and phytoplankton data and thus the value of the final ecological models</p>
<b>Rating</b>	Inadequate

### Budget

<b>Comments</b>	<p>The proposed budget and division of resources is appropriate for the proposal as described except for Task 2. The amount budgeted for the hydrological analysis as described within the proposal is wholly inadequate - 120 hours of one individuals time cannot possibly address the aims of task 2a, even when not taking in to account my suggestions for additional work within 2a. I would recommend a re-costing of Task 2a to provide a more thorough evaluation of the hydrolgical data including inherent and unavoidable uncertainty.</p>
<b>Rating</b>	Inadequate

### Relevance To CALFED

<b>Comments</b>	<p>The porject evidently addresses Tpocs 1 and 2 as stated in the PSP and contributes to Topics 3 and 4. This subject area is listed within the PRTL. The porject aims to make use of existing archived data and samples which is commendable and in accord with relevance to CALFED. In part, the proposed models will provide a degree of scientific integration and</p>
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	synthesis of existing and new hydrological, chemical and ecological data that leads to wards improved system modelling for environmental management. Thus the information to be provided (when the project is properly redesigned) will be a valuable tool for management and policy development.
Rating	Inadequate

## Qualifications

Comments	The proposers have appropriate experience with respect to conducting the biological, ecological and chemical aspects of this proposal and the skills of the team are complimentary. There is a lack of robust hydrological experience to provide a useful assessment of the complex and uncertain hydrology of the system and this is evident in the weakness of the proposal for Task 2a. The infrastructure required to support this project is appropriate and adequate.
Rating	Inadequate

## Overall Evaluation Summary Rating

Comments	This proposal is ambitious but tractable in principle and aims to provide ecological tools and models that would valable for management and policy development. However I cannot recommend funding of the proposal as submitted due to the weakness in the description of the hydrology (notable Task 2a). A robust evaluation of the hydrology, including quantified uncertainty, is required to provide input data and scenarios for tasks 3 and 4. Without this robust framework the ecological models developed may appear sound but they could be wildy inaccurate in reality. I recommends the proposers include a experienced hydrologist (who has knoweldge of uncertainty analysis) within the team and that time is properly costed for a full evaluation of the
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	system hydrology.
Rating	Inadequate

# External Technical Review #3

**Proposal Title:** ECOLOGICAL IMPLICATIONS OF INCREASED SAN JOAQUIN RIVER FLOW IN SAN FRANCISCO BAY/DELTA ECOSYSTEM: INDICATORS OF ADVERSE EFFECTS

**Proposal Number:** 0081

**Proposal Applicant:** U. S. Geological Survey

## Purpose

Comments	The proposal clearly addresses relevant ecosystem management and restoration goals. The proposed work to examine links between (and develop indicators of) San Joaquin River inflows, water quality, and dynamics of invasive species is generally well developed, and justified in its focus and scope. The project would generate novel information in this system, and would inform future work.
Rating	Above Average

## Background

Comments	The investigators present a clear and logical conceptual model to support their proposed work. This model is informed by prior research in the system and some intriguing preliminary data.
Rating	Above Average

## Approach

Comments	<p>The approach is generally well designed for tasks 1, 3, &amp;4; and plans for project management and dissemination of information are clear.</p> <p>A weakness of the proposal is that the hydrological aspects of the research (task 2)</p>
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### External Technical Review #3

	<p>seem underdeveloped, yet are critical to the interpretation of the detailed subsequent analyses of interactions among phytoplankton, contaminants, and invasive bivalves. For example, it seems that the SJR inflows would be moderated by both management of diversions (upstream and locally) as well as climate; these effects would have very different influences on contaminant transport, so it seems essential to do something more complicated than simply look at indicators of flows in the bay and delta. What environmental and management effects are key to moving Se into the SJR, and how does this relate to moderation of inputs to the Bay and Delta? This issue is largely avoided in the proposal; this comment has some relevance to other categories of rankings</p> <p>Finally, the preliminary data presented is intriguing, and generally supports the need to address the issues described. I would, however, have liked to see more data for contaminants from some of the endmembers in the system to support the overarching goals. For example, Fig. 5 doesn't seem to support the inflow hypothesis, or at least the connection to it is not clear to me at all.</p>
<b>Rating</b>	Above Average

### Feasibility

<b>Comments</b>	<p>With the exception of the hydrology component, the research is well-described and appropriate for addressing the stated goals. Given the authors' past work and familiarity with the system, most tasks have appeared to have a high likelihood of success even though the challenges of spatial and temporal complexity presented are non-trivial.</p>
<b>Rating</b>	Above Average



### External Technical Review #3

#### Budget

Comments	Budget is clear, and seems well matched to the scope of the proposed work.
Rating	Above Average

#### Relevance To CALFED

Comments	This work is directly relevant to CALFED goals. While the work focuses on invasive species there are clear and strong connections to eutrophication, contaminants, native fishes, and hydrologic change. The proposal will make good use of existing information through synthesis and modeling; this will complement collection of new data in key areas. The information generated by the project would be very likely be useful to CALFED at many scales, in particular through the strong links to large scale management decisions.
Rating	Superior

#### Qualifications

Comments	The group are clearly well qualified to implement most aspects of the work. They have done excellent work in the system in the past, and thus have a proven track record. The only significant potential limitation, as discussed previously, is the hydrological components of the project. The group should be able to secure assistance in this area from colleagues as necessary, but may want to consider future collaborations that would expand and improve this area of the proposal.
Rating	Above Average

#### Overall Evaluation Summary Rating

Comments	A strong proposal to address important problems of high relevance to CALFED, and the delta/bay ecosystem.
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External Technical Review #3

	There is a potential need to consider more complex models of inflow hydrology and its effects.
Rating	Above Average